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RISK ASSESSMENT WORK PLAN ADDENDUM

12/02/91

USEPA/DOE-FO
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LETTER

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5
230 SOUTH DEARBORN ST.
CHICAGO, ILLINOIS 60604

2842

DEC 0 2 1991

REPLY TO ATTENTION OF:

Mr. Jack R. Craig
United States Department of Energy
Feed Materials Production Center
P.O. Box 398705
Cincinnati, Ohio 45239-8705

HRE-8J

RE: Risk Assessment Work Plan
Addendum

Dear Mr. Craig:

The United States Environmental Protection Agency (U.S. EPA) has completed its review of the Risk Assessment Work Plan Addendum.

U.S. EPA hereby disapproves the Work Plan pending incorporation of the enclosed comments. As a result of the large volume of comments, it is recommended that after reviewing this document, the United States Department of Energy (U.S. DOE) schedule a meeting with U.S. EPA to discuss these comments.

Please contact me at (312/FTS) 886-0992 if you have any questions.

Sincerely,

James A. Saric
Remedial Project Manager

Enclosure

cc: Graham Mitchell, OEPA-SWDO
Pat Whitfield, U.S. DOE-HDQ

(janke)
action
response
To F-0089
(E503)

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U.S. EPA COMMENTS ON THE FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
"RISK ASSESSMENT WORK PLAN ADDENDUM"
DATED OCTOBER, 1991

[redacted]

GENERAL COMMENTS

1. The uncertainty discussions that recur in this document strongly indicate that this will be a theme in the final document. This is a delicate issue. If handled reasonably, the reader will understand the real limits of the estimates made. If handled inappropriately, the entire credibility of the document could be undermined.

2. Section 10 establishes quite definitely that the issue of ARAR based cleanup goals over risk based goals (10^{-4} to 10^{-6}) is favored by DOE. This fundamental issue should be resolved.

3. Specific and default parameters for all codes should be consistent.

4. The plan sets out the methodology for developing risk assessments for each of the operable units at the site. While the all-over approach is generally acceptable, the risk assessment work plan addendum fails to incorporate comments presented in the prior review of the draft work plan and deviates considerably from the methodology agreed to by DOE and EPA at the September 11, 1991 meeting in Chicago. These changes are not acceptable, and the previously discussed and agreed to methodology should be incorporated here.

5. It should also be noted that the models have <u>not</u> been approved and will be examined at length to determine if they are appropriate and the assumptions and parameter values are reasonable for each OU at the site during the review of the individual OU risk assessments. Some assumptions and parameter values may need to be changed as the operable unit risk assessments are developed.

6. Included is a draft of RAGS, Part B, which should be helpful in preparation of the Preliminary Risk Assessment. It has been through sign-off and the printers. This is expected to be the distribution document. Consistency with this guidance is encouraged in the Preliminary RA.

7. In the Risk Assessment Work Plan, operable units (OU) are considered to be distinct. U.S. EPA (1989a) shows that risks from two OUs may need to be considered as a cumulative total if potential exists for exposure to both OUs. Not considering the risks resulting from exposure to contaminants from multiple OUs either by contaminant migration, receptor behavior, or direct overlap of OUs may significantly underestimate risk associated with each OU as well as for the site as a whole. In the

baseline and FS risk assessments as well as in the use of the site-wide optimization model, risks from exposure to multiple OUs should be considered.

8. At various points in the work plan, including the discussion of the site-wide optimization model in Section 10.0, it is unclear whether the OU risk being discussed is the sum of the risks from exposure to both chemicals and radionuclides of potential concern or whether these risks are being considered separately. This matter should be clarified throughout the work plan.

9. Spot-checks of equations and parameter values were conducted throughout Sections 5.0, 6.3, 6.5, 7.0, and 10.0 when the references were available. The equations reviewed include 6-25, 6-26, 7-2, 7-3, 7-8, 7-14, 7-23, and 7-27. Parameter values reviewed include (1) the concentration ratios obtained from Baes et al 1984 listed in Section 7.0 on Page 20; (2) the specific activities of radionuclides listed in Section 7.0, on Page 21; and (3) the soil-to-plant and plant-to-plant-to-beef transfer coefficients for the radionuclides listed in Table 7-2. The equations and parameters checked are consistent with the references cited except for Equations 6-25, 6-26, and 7-14. The discrepancies are detailed below.

Equation 6-25 should read as follows:

$$J_i = (10^4)(R)(\rho)(E)[(\lambda)(D_i)]^{1/2}(\tanh[(x_i)(\lambda/DC_i)^{1/2}$$

The denominator of Equation 6-26 should read as follows: $[1 + ((a_i/a_t)^{1/2})(\tanh(h_i x_i))] + [1 - ((a_i/a_t)^{1/2}(\tanh(h_i x_i))]\, e^{-2hcx}$

Equation 7-14 does not consider decay of the radionuclide over time that occurs from the time of consumption by the animal to the time of consumption of the animal product by a human. However, this may not be a factor if the radionuclides of concern have very long half-lives. Equation 7-14 should be revised to account for radionuclide decay.

10. Throughout Section 6.0, references are made to an "EPA 70-year rule." The work plan should clarify the applicability of this "rule" to the FEMP site.

11. Section 7.3 states that the source geometries at the FEMP site preclude the use of U.S. EPA external gamma slope factors. Therefore, Microshield 3.0 will be used to calculate exposure rates from external sources at the FEMP site. The final risk assessment should include the input variables chosen to characterize exposures at the FEMP site and the rationale for their use. In addition, the discussion of uncertainties should include discussion of the chosen input variables and the effect of those choices on the risk assessment.

12. Section 9.5 discusses uncertainties associated with the risk assessment. The text states that these uncertainties will be discussed in the context of how they may affect overestimation of risk at the site. Many factors associated with uncertainty can also contribute to

underestimation of risk. Among these factors are the additivity assumption and the lack of toxicity values for all contaminants at a site. The discussion of uncertainties should be broadened to address these issues.

13. Section 10.2.3.1 discusses risks to the public during remediation. Pathways discussed include transportation incidents and airborne releases. If the intent is to evaluate risks to the public during remediation, all risks to nearby residential populations evaluated in the baseline risk assessment should be addressed because all these risks will be present during the remediation process. However, if the intent is to evaluate risks to the public from the remediation process, the pathways listed in this section are adequate.

SPECIFIC COMMENTS

14. Definitions, p xv., lines 20-24 **Please correct the "Intake" definition as follows: For chemicals, it is expressed as the mass of a chemical in contact with the exchange boundry of a receptor ..... Intake refers to and is equivalent to the administered dose for chemicals. Inhalation, ingestion and dermal absorption are the three most important routes by which chemicals and radionuclides enter the body. The amount of a chemical entering the body by the dermal absorption route is refered to as the Absorbed Dose, or the mass of a chemical penetrating the exchange boundary of an organism after contact.**

15. Figure 1-2 Delineating Operable Unit 3 would improve this figure. An additional figure, such as Figure 1-3 and 1-4, which designates the specific features of Operable Unit 3 would also improve the utility of this document.

16. Section 2.1 Undoubtedly EPA guidance will be modified and expanded during the course of this assessment. A statement should be added about how the assessment procedures will adapt to significant new guidance, perhaps introduced within four months of the draft publiciation.

17. Section 2.2.1, Page 4, Paragraph 0 The specific acceptable risk estimates that are considered protective of human health and that will be used as criteria in selection of a remedial alternative should be specified here.

18. Section 2.3.1, bullet 6 Results should not be presented solely as a total risk. It will be essential to see risk broken down by contaminant and pathway to the extent feasible.

19. Section 2.3.1, bullet 9 Risks should be broken down by radionuclide to the extent feasible so that major contributors by pathway, inhalation for example, can be established. This may not have to be for every single case, but should include enough examples to clearly delineate what are the significant contributors.

20. Section 2.3.2, page 7, para. 2 If the results are summed too much, then much of the specific information will be lost. Inclusive summations are acceptable so long as there is also more detailed information on the results that were summed.

21. Section 2.3.4, Page 8, Paragraph 0 See the comment for Section 2.2.1, Page 4, Paragraph 0 (#17).

22. Section 3.0, p 1, line 24- p 2, line 2 The discussion on data use does not discuss how data will be handled if primary and secondary data (by the definition given) are conflicting and inconsistent. In most risk assessments, the consistency of primary and secondary data is evaluated

and reported; any descrepencies are noted and explained. Inconsistency with secondary data may point out the need for further sampling.

23. **Section 3.1, 2nd set of bullets** Within the RI/FS data base should be the Miami University study on stress identified among several wildlife populations on the FEMP property and the area residential data on groundwater and radon obtained by the Ohio Department of Health.

24. Section 3.3, Page 5, Paragraph 3, 2nd Bullet The test should indicate whether the data sources are listed hierarchically. Also, in the final line under this bullet, "DOE-response" should be "dose-response."

25. **Section 3.4** Toxicity data on radionuclides could also be available from publications of the International Committee on Radiological Protection (ICRP) and the National Council on Radiation Protection and Measurements (NCRP).

26. Section 3.4, p 5, lines 27-31 For both carcinogens and noncarcinogens, the hierachy of data sources includes a literature evaluation and recommendation by the Environmental Criteria Assessment Office (ECAO), Cincinnati. Use of DOE-response data from the literature is not acceptable unless it has been reviewed by ECAO.

27. Section 4.0, p2, lines 5-7 The referenced methods for addressing ground water monitoring data are not appropriate for estimations of risk at Superfund sites for a variety of reasons. In addition, Region V has its own policy regarding ground water data (see enclosure). In general, the arithmetic mean, or adjusted arithmetic mean, concentration for background is compared with the mean concentration of the 1-3 wells that characterize the center of the plume of concern, using an appropriate statistical method such as the modified Students t-test. We recommend that this approach be followed at the FEMP; it will eliminate problems of differing MDLs. RAGS specifically advises against the use of detection limits (DLs) at any stage of the sample concentration calculation, and stresses instead the use of 1/2 the sample quantitation limit (SQL) for nondetects in all calculations.

28. **Section 4.1, page 1, bullet 1** Was the intent here to rule out use of data from gamma spectrometry which is not necessarily specific?

29. **Section 4.1, page 1, bullet 5** It is unclear from this bullet what "J" qualifier data is or where it is to be found.

30. **Section 4.2, Page 2, Paragraph 2: The cited guidance (U.S. EPA, 1989b) states that tolerance intervals "can be applied with as few as three of the observations from the background distribution. However, doing so would resultin a large upper tolerance limit. A sample size of eight or more results in an adequate tolerance interval." The cited guidance also discusses use of tolerance intervals for statistical analysis of groundwater at sites that "overlie extensive, homogenous geologic**

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deposits that do not naturally display hydrogeochemical varations." It is not clear whether use of tolerance intervals is appropriate for groundwater at the FEMP site or whether use of tolerance interval is appropriate for soils and sediments that are likely to be far less homogeneous than groundwater. If tolerance intervals are used, at least eight background samples should be used to construct them.

31. Section 4.2, page 2, para. 3 Three sampling locations are too few to establish levels as critical as background. In the Uranium Mill Tailings Remedial Action Project in Grand Junction, Colorado, conducted by DOE, the inclusion protocol for contaminated vicinity properties contains the following statement,

"Background levels will be calculated from measurements made at a minimum of 30 representative locations within the region surrounding a designated processing site, taking into account any subregions where unusually high or low background levels may exist. Such measurements will not be made in the vicinity of known radioactive contamination. From these data, a mean background level and a standard deviation of the mean are calculated for use in establishing action levels for both indoor and outdoor on-site surveys within the region." ("Summary Protocol, UMTRAP Vicinity Properties, Identification-Characterization-Inclusion," U.S. DOE, September 1983)

32. Section 4.2, page 2, para. 6 This process can not always be relied upon to identify outliers. For example, if the detection limit (MDL) for uranium in soil was 0.1 pCi/g (not uncommon), then data would be considered an outlier at any level above 1 pCi/g. 1 pCi/g is about background. Thus, the process would label anything above background an outlier.

33. Section 4.2, Page 3, Paragraph 2 The text should clarify whether the minimum detection limit (MDL) or one-half the MDL will be used in place of not detected (ND) sample concentrations to calculate the mean for a medium when a concentration greater than the detection limit is detected in at least one sample from that medium. It should also be noted that, in such situations, U.S. EPA (1989a) recommends use of one-half the sample quantitation limit (SQL).

34. Section 4.2, page 3, para. 2 A basic question in this section is why the MDL changed. If analyses were done for radioactive materials, what was not constant, the background, the count time, the sample size, the counting geometry, or what? Does this indicate a faulty analytical protocol? The idea of "adjusting" the data to conform to a standardized MDL needs far more justification before it would be deemed acceptable.

Since there is a fundamental difference between the radiological definition of minimum detectable level and the chemical definition of minimum detectable level, does this paragraph represent a difference in semantics?

35. General Comments for Section 4.3—Why is so much effort spent in setting up criteria to eliminate data? Does this indicate a general distrust with the data collected?

36. Section 4.3, lines 5-7 The 5% limit for exclusion as a Chemical of Concern (COC) is offered as an example in RAGS, not a rule. The use of a fequency of detection limit for exclusion of chemicals is subject to approval by the project manager for the site, who may wave this rule or set a more stringent value (i.e., 1%). Highly toxic chemicals, including carcinogens, should never be excluded on the basis of a frequency of detection limit.

37. Section 4.3, p 3, line 11 - p 5, line 2 As stated above, the use of DLs is contrary to RAGS guidance, which specifies the use of 1/2 the SQL for nondetects in the calculation of mean concentration values. See RAGS, section 5.3 for further explanation.

38. **Section 4.3, page 5, para. 2** The elimination of radionuclides from analysis for a medium should not occur until it can be established conclusively that they were not there. Because of background levels, certain radionuclides like uranium, thorium and radium should be expected to be in all samples. If they weren't, then this might represent a lack of request for this analysis or a faulty analysis. Moreover, for radionuclides it may be the case that a parent radionuclide was measured and its decay products can be assumed without specific analysis (e.g., radium-226 producing radon-222). Further, some radionuclides tend to pair up and when one is measured the other is assumed to be there also (e.g., if uranium-238 is measured, then uranium-234 is assumed to be there in equal activity). The process advocated here is prone to significant errors.

    Rejection of contaminant data when 5% or less of the analyses showed positive results could be very significant. If 1000 samples were analyzed, the data from fifty data points might establish an actual problem. By the proposed protocol these 50 points would be discarded. The process advocated here is prone to significant errors when the data base is large.

39. **Section 4.3, p 5 Bullets 2 and 4 seem to be contradictory. What statistical methods will be used for large sample populations?**

40. Section 4.3, page 5, bullet 1--This bullet assumes that samples may be contaminated with laboratory chemicals. Has this been the case in analyses done to date?

    Specifically, what common laboratory chemicals might also be process chemicals?

    Does this process apply to radionuclides as well?

41. Section 4.3, page 5, bullet 2 A sample size of 8 is too few for creating a distribution. This advocated process is prone to great uncertainties.

42. Section 4.3, Page 5, Paragraph 2, 2nd Bullet If the sample population is large, a more reliable statistical comparison to background levels should be used, such as the Student's t-test discussed in the 4th bullet.

43. Section 4.3, Page 5, Paragraph 2, 3rd Bullet Chemicals and radionuclides should not be considered naturally occurring and eliminated as chemicals of potential concern without a reliable estimate of background concentrations. If the sample population is extremely limited, and if a reliable statistical comparison to background levels cannot be performed, a chemical or radionuclide should be assumed to be site-related.

44. Section 4.3, page 5, bullet 3 The first question to answer is why there are too few samples? Unless there are prodigious constraints, teams should go out into the field and get the data required.

Does this process apply to radionuclides as well?

45. **Section 4.3, page 5, bullet 4** The level of significance is not specified.

46. Section 4.3, page 5, para. 3 Obtaining sufficient data for background determinations must be the first task. It is unacceptable to not to have a firm measure of background for at least all of the contaminants of concern.

What is the significance of the term "...sequential criteria"?

47. Section 4.3, Page 6, Paragraph 1 U.S. EPA (1989b) recommends that concentrations detected in individual on-site samples be compared to the constructed tolerance limits; if a concentration detected in an on-site sample exceeds the upper tolerance limit, the contamination is shown to be site-related. Therefore, individual sample concentrations should be compared to the constructed tolerance limits and not to sample population means that may mask significant detected concentrations.

48. **Section 4.3, p 6, lines 1-5 This approach is unacceptable for the reasons stated above in comments # 4 and 5 - inappropriate statistical methods and lack of consistency with Region V ground water policy.**

49. Section 4.3, page 6, para. 1, last sentence This process could be prone to error since the site-related mean is a product of the number of samples taken away from hot spots. Good field sampling will identify hot spots, if they are present, even though they may be found only within small areas. In which case, the contaminants found in the hot spots should be listed as contaminants of concern. If much of the site is contaminant free, then the using a site-related mean will diminish

the elevated data in hot spots and lead to a failure to identify contaminants are really present.

50. **Section 4.3, page 6, para. 2** The purpose of this exclusion is not clear. Were chemicals that are human nutrients used at the site? If so, there does not seem to be a sound basis for their elimination.

Will this process be applied to radionuclides as well?

Low concentration contaminants could still be significant. For example, in the case of the radionuclide actinium-227, it's high dose conversion factor makes its impact, even at low concentrations, significant.

It is far too vague to state that concentrations "...only slightly above background mean concentrations" will be eliminated. There should be a numerical criteria.

51. **Section 4.3, page 6, para. 3** For certain radionuclides, as noted above, the concentration is not the sole factor in the risk determination. The dose conversion factor is also important. To repeat the example, for actinium-227 the high dose conversion factor can make even low concentrations significant dosewise and riskwise.

52. **Section 4.3, page 6, para. 4** Pathway may also be a factor. For example, most of the inhalation risk could be a result of thorium-230 and actinium-227. Is it the intent of this process to eliminate uranium-238 and thorium-232 for inhalation calculations if they contribute less than 1% of the total inhalation dose (risk)? In addition, if a radionuclide is found to be signficant in one pathway, will it be included in all other pathway calculations?

53. Section 4.3, Page 7, Paragraph 2 Chemicals and radionuclides eliminated from the list of chemicals of potential concern because of low risk to human health should not necessarily be eliminated from the ecological assessment. Some chemicals or radionuclides may pose little threat to human health and yet pose a significant risk to other eccological receptors. A list of chemicals of potential concern should be prepared separately for the human health risk assessment and ecological assessment.

54. **Table 4-2, page 8** It is not entirely clear how to read this table. The precise ways in which "present" and "not present" labels were assigned needs to be specified. If no analysis was performed for a particular radionuclide would it be listed as not present? For example, since ores were once handled in OU3 why weren't actinium-227 and protactinium-231 found since they would be considered to be present in any uranium ore?

55. **Section 5.1.1.4, Page 2, Paragraph 4 The distance from the site boundary to the nearest residence should be given.**

56. **Section 5.1.1.4, Page 2, Paragraph 5 The text should indicate the proximity of the estimated population and of the nearest individual to the site boundary as to well as the plant center.**

57. **Section 5.1.2, page 10** A principal radiological constituent for the site has to include uranium-235 and its decay products. The original ores were chosen for their high total uranium content (which would include the uranium-235 series), actinium series decay products have been identified on the site, and some of the decay products may contribute to significant dose in certain pathways.

58. **Section 5.1.4, page 12** The dairy farm at the edge of the FEMP site could be a source of potential impact upon the populace. It could certainly be a matter of public concern about drinking milk from this source. It is recommended that a subpopulation of milk drinkers for this site be included in the dose (risk) analysis if that was not the intent of bullet 4 on page 14 of Section 5.1.4.2.

59. Section 5.1.4.1, Page 13, Paragraph 0 The text should address any recreational facilities such as parks or swimming pools potentially affected by the site. Also, recreational uses of the Greater Miami River other than fishing, such as boating, water-skiing, and swimming, should be considered.

60. Section 5.1.4.2, p 13-14 It appears that some exposed population groups have been lost in this new listing of "Exposures Assuming Current Access Controls Continue" and "Potential Exposures Assuming Current Access Controls Are Discontinued". At the September 11 meeting, it was allowed that the Current risk scenarios will be 2-tiered and will allow presentation of risks "assuming access controls" and "without access controls". This is a baseline risk assessment workplan. It assumes no action at the site and seeks to evaluate risks to all generations given no remediation at the site and no change in land use. Given the present state of the economy, it is important to document the underlying risks to all populations of interest should remediation be interupted. The present strategy, assuming current land use of FEMP property will continue until remediation activities end, at which time active security controls will be discontinues" is appropriate for the calculation of "with controls" scenarios. The "without controls" scenarios should incorporate the same populations in addition to the two listed on page 14, lines 29-41, but consider that the remediations do not take place and security becomes relaxed or unaffordable. Appropriate populations to be considered were presented and approved in the prior version (7/29/91) of this document in section 5.0, page 11. Omitted populations should be included in this version.

61. **Section 5.1.4.2, page 14, bullets 1-4**--Section 5.1.4.1 states that 87 people live within 1 mile of the FEMP. Scenarios should be developed to deal with the risks to these people assuming current access controls continue and assuming current access controls are discontinued.

62. **Section 5.1.4.2, page 14, bullet 5** In farmland area within which the FEMP is sited, home gardens are expected to be the norm. A home garden should be included in this scenario, especially since lead-212 from the uranium-238 series could be a significant contributor.

63. **Section 5.1.4.2, page 13, and Section 5.1.4.3, page 15** Present risk scenarios, both onsite and offsite, should include the K-65 silos. The silos presently do not have assured integrity and could be degraded further in the future.

64. Section 5.1.4.2, p 14, bullets The "Visitor/trespasser" scenario is the regular visitor/ non-FEMP worker. The "Exploring child" includes trespass scenarios inside the FEMP site. The exposures to the "Off-site farmer" should include exposure to the entire farm family, including children who may accompany the farmer on-site and also trespass in Paddys Run. Who is the population receptor in the "On-site grazing" scenario - the farm family who consumes the dairy products? It is important to identify the Maximumly Exposed Individuals (MEIs) so that all applicable pathways may be summed to determine the RME risk.

65. Section 5.1.4.2, Page 14, Paragraph 1 The sentence preceding the bulleted items should be revised to indicate that the following two populations are not the only populations exposed in the scenario but are in fact two additional exposed populations.

66. Section 5.1.4.3, Page 15, Paragraph 3 The text should clarify whether the farm family's exposure to dust includes exposure to particulates generated by wind erosion and farming operations.

67. Section 5.1.4.3, p 15 It is not clear from the discussion that the Future scenarios will address a change in land use given no action taken at the site (other than that which has been completed at the time of the preparation of the baseline risk assessment for that OU). Please clarify this point in this section.

68. Section 5.1.4.4, p 15 It is not clear to which scenarios the Occupational Receptors belong. Please clarify in the opening paragraph that Occupational Receptors are being identified here for the FS alternatives risk assessments. A more appropriate heading would be Scenarios for Evaluating FS Alternatives. Lines 4-10 on this page also belong to this section.

69. **Section 5.1.4.4, page 17, para. 5** Since delivery workers are regular site visitors, there should be a quantitative evaluation of their potential exposure. This could provide information for the worker or for the general public to answer this inevitable question.

70. Section 5.2.1, Page 20, Paragraph 2 This paragraph should discuss the potential for contaminant migration via deposition of airborne particulates into surface water bodies.

71. **Section 5.2.1, page 21, para. 1** The question may be asked about the release of radon from groundwater within homes. Is it the intent of these calculations to include this pathway?

72. **Section 5.2.2, page 21** There is a need to define the potential for risks from other isotopes of radon, namely radon-220 (thoron) and radon-219 (actinon). In Table 4-2, radon-220 is listed as found in OU3 and radium-224, thoron's parent, is listed as found in OU4. In former buildings associated with Futura Coatings site in St. Louis, actinon was found by both Oak Ridge National Laboratory and Argonne National Laboratory, at levels on the order of 80% of the total radon concentration. The St. Louis site is part of the larger site associated with the former uranium extraction operations at the Mallinckrodt Chemical Company. It is believed that Mallinckrodt wastes, which are similar to FEMP radiological wastes, were shipped from St. Louis to the FMPC in the past.

73. **Table 5-2**—The use of N and Y here is not clear. Does it mean no radiation exposure and yes radiation exposure, respectively? If so, how can a remediation worker not get a radiation exposure when working amongst radioactive materials?

74. Section 5.2.4, Page 22, Paragraph 3 The site characterization should clarify whether surface water bodies located on site contain water all year or whether they dry out in summer. If a surface water body dries out in summer, then it is reasonable to consider exposure to sediments associated with that surface water body to be similar to exposure to surface soils during the dry period(s).

75. Section 5.3, Page 23, Paragraph 1 The first sentence should be revised to indicate that an exposure pathway will also be selected for detailed evaluation if the pathway is potentially complete, as in a future land use scenario.

76. **Section 5.3, page 23, from "An exposure pathway.." to "..receptor is exposed)"** It's hard to imagine reasonable pathways that wouldn't de facto fit these four criteria. It is also possible to imagine unreasonable pathways that would fit these four criteria, specifically, a person swimming in a cave in an pool fed by contaminated groundwater. Unless a strong justification can be offered, it is suggested that the pathway elimination mechanism be dropped since it is unable to adequately descriminate reasonable from unreasonable pathways.

77. Table 5.3, pp 24-25 For id 5 and 6, Surface soil, why is the 1b pathway omitted for some OUs? Given no access controls, all OUs could be accessible to trespass. In the groundwater pathway, id 24, inhalation and dermal absorption of chemicals in domestic groundwater are missing. Use of domestic groundwater should include exposure to chemicals in this medium by all three pathways. For id 34 and 35, sediment, the logic for including these pathways in all OUs is the same as stated above for Surface soil.

78. Section 5.3.1, p27... Explanation of exposure pathways should match the id numbers in Table 5.3 - i.e., # 7 (Direct ingestion of soil/waste) should match # 7 in the table, etc. Number 33 should also include ingestion of contaminated sediments along with surface water - i.e., cattle drinking or foraging in Paddys Run.

79. Section 5.3.1, Page 27, Paragraph 1 Incidental ingestion of surface water during recreational use should be added to the group of pathways and to Table 5-3. Similarly, soil gas migration into residences should be considered in the future land use scenario and possibly in the current land use scenario, depending on the proximity of the nearest receptor and on the concentrations of contaminants identified in soil gas. This pathway presents the potential for significant exposure, especially to radionuclides that have a gas phase decay product.

80. Section 5.3.3, Page 30, Paragraph 0, Item No. 25 The text should clarify which routes will be considered in the evaluation of exposure resulting from use of potable domestic water.

81. Section 5.3.4, Page 30, Paragraph 1 See the comment for Section 5.3.1, Page 27, Paragraph 1.

82. **Section 5.4, page 31** Justification needs to be provided for not assuming that a person can be exposed under more than one scenario? Could a person live within 1 mile of the site and also work or visit the site?

It in addition to concentration, the dose conversion factor for radionuclides is very important. For example the inhalation dose conversion factor for actinium-227 is 150 to 780 times that for radium-226. Therefore, small concentrations of actinium-227 might be more significant than larger concentrations of radium-226.

83. **Section 5.4.1, page 32, para. 1** It does not appear that a hypothetical receptor would constitute a complete pathway as specified in Section 5.3, (i.e., the four criteria are not all met).

84. Table 5.4, p 33 It would be more appropriate to identify RME locations for each OU in such a manner as to allow for the development of the MEI when all pathways and all OUs are combined.

For OU4, will the resident farmer be upwind or downwind of the silos? From past experiences, the radon risk would be expected to dominate over the shine risk and, therefore, the exposed individual should be downwind unless there are extenuating conditions.

85. **Section 5.5, page 35** There is an alternative to modeling and that is to collect additional data. Actual data may be far superior to any modeled data. Justification should be given as to why further data will or cannot be collected before modeling is initiated.

For all codes used, site specific parameters are highly preferred over reference or generic data. The Ohio Division of Geological Survey and the U.S. Geologic Survey should be relied upon as sources of site parameters.

86. **Table 5-7, page 36** This table should be modified to reflect a decision to or not to collect additional data.

87. Figure 5-7, p 36 The accompanying text, page 35, suggests that collection of additional data may be necessary for the quantitative evaluation of a pathway. This option is not reflected in the table and should be included at this stage as an alternative to Modeling Exposure Concentrations.

88. Chapter 6.0 The appropriateness of each model and the accompanying parameter values should be evaluated for each OU unit and approval for each model use given at that time. Models cannot be approved in the absence of conditions and data.

89. **Table 6-1, page 2** The following comments are made on the listed codes.

MICROAIRDOS is not one of the AIRDOS-EPA family of codes, but a separate commercial product. Consequently, we are reluctant to see it used but will accept its results so long as all input parameters are supplied to EPA Region V and specific comparisons are made that, with these parameters, establish that results using official AIRDOS-EPA codes are comparable.

Simple Box Model--This model is too primitive for acceptance in this risk assessment. It assumes a uniform concentration in a box of arbitrary dimensions. It is suggested that a model such as the Industrial Source Complex Long Term model be used for near source calculations (< 100 m). Adaptation will have to be made for radionuclides.

PRESTO-EPA-CPG has been modified by many parties. The version used should be the last developed by EPA Office of Radiation Programs. There is also a PC version developed that may be of some use.

RESRAD, in this reviewer's experience, has features that must be recognized before it is used:

The code calculates dose on the basis of large cylindrical sources. Where sources are small in area or snake over the area, the results are obtained by modifications that may or may not be appropriate. Care should be taken when the code is used with these nonstandard source configurations.

The accumulation of dose by radionuclide over long time periods may be confused because decay product dose is listed under the parent dose. For example, if radium-226 and thorium-230 were contaminants of concern, the radium-226 dose would appear to diminish with time even though there is radium-226 ingrowth from thorium-230. This is because the ingrowth dose from radium-226 is registered with the parent, thorium-230, and not registered as total radium-226 dose. The total radium-226 dose could be determined by going into the detailed summary section in the code.

The radon section of the code considers diffusion only, there is no advection section. Advection, from low pressures created within the structure, can dominate diffusion considerably in real situations. Thus, the radon section may underestimate the radon dose. It is recommended that this section not be used.

The default values used in the RESRAD code should be reviewed to ensure that the committment made in this risk assessment to follow EPA guidelines is adhered to. For example, the default value in RESRAD for drinking water is 410 liters/year while, under EPA's Interim Primary Drinking Water Act, the assumption is 730 liters/year (365 days @ 2 liters/day).

Where RESRAD can be compared to other codes or to EPA guidance, such as slope factors, the comparison should be made to ensure consistency. Please inform EPA Region V about the results of these comparisons.

It may be desirable to add CARBDOSE to the list of potential codes. This code calculates gamma exposure dose from home activated charcoal water treatment units. Where the FEMP site may have increased the groundwater concentration of radon, this will appear as excess gamma exposure from these home units. Where radon levels are high, the exposure rate in some parts of the country has been high enough to require shielding (> 5 mR/hr).

For all codes it will be important to use site specific parameters to the extent possible. Where these are not available, Ohio and U.S. geologic surveys should be consulted.

90. Section 6.1, Page 4, Paragraph 1 The work plan describes pathways for transferring contaminants from the unsaturated zone to the aquifer. The work plan should also describe the potential for migration of volatile organic compounds (VOC) in the gas phase. The impact on contaminant concentrations in the aquifer from such transfer processes should be discussed.

91. Section 6.1.1.3, Page 9, Paragraph 4 The reference cited for the "EPA 70-year rule" should be more specifically called out (i.e., Section and Page).

92. Section 6.1.1.4, Page 9, Paragraph 6; Page 10, Paragraph 1 The procedure for estimating organic contaminant concentrations in leachate is not clear. The text should clarify how Toxicity Characteristic Leaching Procedure (TCLP) test results or the 70-year rule will be used to estimate solubility-based leachate concentrations. Also, the text should explain why contaminant concentrations will decrease logarithmically.

93. Section 6.1.4.6, Page 18, Paragraph 4 The second sentence should discuss the criteria that will be used to determine similarities in soil types for estimating K_d values.

94. Section 6.1.4.6, Page 18, Equation 6-5 A reference should be provided for this equation, and its applicability to estimating K_d values from K_{oc} values should be discussed.

95. Section 6.1.4.6, Page 19, Paragraph 1 An appropriate reference should be provided for the U.S. EPA. Water Engineering Laboratory Treatability Database.

96. Section 6.1.4.6, Page 19, Equation 6-6 Numerous relationships are available in the literature for estimating K_{oc} from K_{ow}. Equation 6-6 is only one such relationship, and it may not be applicable to all chemicals listed in Table 6-4. K_{oc} values published in recent literature should be used preferentially. If K_{oc} values are not available in the literature, equations for estimating K_{oc} from K_{ow} or water solubility should be used. The available literature, such as Lyman (1982), should be consulted to determine the criteria for selecting a specific K_{ow} or a solubility-based relationship for estimating K_{oc}.

97. **Table 6-3, page 20** Is this table inclusive for all radionuclides likely to be found at the FEMP?

98. Section 6.1.4.6, Page 20, Table 6-3 References should be provided for the K_d values listed.

99. Section 6.1.4.6, Page 21, Table 6-4 References should be provided for the K_{ow}, K_d, f, X^s_{oc}, and X^f_{oc} values listed.

100. Section 6.2, Page 25, Line 20 Parameter values for USLE and MUSLE are not listed in Table 6-5, as stated in the text, or elsewhere. This omission should be corrected.

101. Section 6.3, Page 25 The work plan should justify use of specific air dispersion models selected for application at a Superfund site such as FEMP. U.S. EPA (1989c) states that atmospheric dispersion models typically used for air permit applications may not be applicable to a Superfund site. Guidelines on Air Quality Models (U.S. EPA, 1986) and U.S. EPA (1989c) should be consulted for appropriate models.

102. Section 6.3.1.3, Page 30, Equation 6-21 "LS" should be defined.

103. Section 6.3.1.3, Page 31, Paragraph 1 The first sentence is not complete and should be revised.

104. Section 6.3.2.1, Page 31, Paragraph 2: The volatilization models do not address VOC emissions from sources other than those related to remedial activities. The work plan should clarify why such sources are not addressed.

105. Section 6.3.2.1, Page 31, Equation 6-22 Use of this equation for estimating the emission rate should be justified. U.S. EPA (1989d) specifically discusses air emissions from remedial activities; this source should be consulted for appropriate models.

106. **Section 6-4, page 35, para. 2** Before modeling dermal uptake of radionuclides the USEPA Region V Radiation Section should be consulted. The reason for this is that EPA issued "Interim Guidance for Dermal Exposure Assessment" (EPA 600/8-91-0011A, March 1991). Using this document might lead to an assumption of high dose attributable to dermal uptake of metals like uranium. Since this diverges from historical assumptions in health physics, EPA wishes to discuss the matter with our Headquarters before modeling is initiated for this pathway.

107. **Section 6.6, page 39** When two codes are able to calculate the same quantity they should be intercompared.

108. Section 7.0, p 3, para. 1 As noted in the review of the prior draft, it is permissible to subtract the background concentration for radionuclides to calculate the site-influenced risk to these chemicals. However, when a comparison to background radionuclide risks is to to included in the risk assessment, it is more reasonable to compare the background risk to the background-plus-site-influenced risks from these compounds, as the latter represents the total exposure to the identified receptors. This comparison better illustrates the impact of the added risks due to the site.

For non-radioactive organics, the background is assumed to be zero; therefore, comparison with background is unnecessary. A good approach would be to prepare a summary table showing the background risk, risk from chemicals at the site and the total population risk from background-plus-site.

[redacted]

109. **Section 7.1, page 1, para 2** The two step approach outlined in this section is reasonable, but was not well defined in Section 6 where modeling was given as the only alternative to insufficient data. Section 6 should be modified to reflect the two step approach of this paragraph, namely when data is insufficient in quality or quantity more data will be gathered if possible and, if not possible, then modeling will be used.

110. Section 7.1.2, Page 2, Paragraph 3, Equation 7-1 According to U.S. EPA (1989a), either the 95-percent upper confidence limit (UCL) or the maximum concentration detected, may be used, but not the mean. The equation should be revised accordingly.

111. Section 7.1.2, Page 2, Paragraph 3, Equation 7-1 The source of the value 1.96 should be provided.

112. **Section 7.1.2, page 2, para. 3 and 4** Deviation from the 95th percentile protocol should not result in an arbitrary substitution as proposed here. It is entirely possible that unmeasured concentrations on a site may be higher than any measured to date. This is an assumption of the 95th percentile protocol. The 95th percentile approach should be maintained.

113. Section 7.1.2, Page 3, Paragraph 1 It is reasonable to subtract background concentrations of naturally occurring radionuclides from on-site concentrations, but this should not be done for manmade radionuclides. There should be no natural background levels for manmade radionuclides. Also, the text should clarify whether subtraction of background concentrations for naturally occurring radionuclides will be done for each sample before calculating on-site means, or after the means are calculated. Also, natural background concentrations to be subtracted should be obtained from samples from similar geologic formations well outside the influence of the site.

114. **Section 7.1.2, page 3, para. 1** There is no reason to spend time and money quantifying exposures and risks from background when these are unavoidable. Risks will be specified as excess risk in any case. Delete the two sentences beginning "In addition, exposures.....to the site."

115. **Section 7.1.3, page 3**--Direct sampling is superior to modeling. Modeling should be viewed as a last resort when direct sampling is not possible.

116. **Section 7.2.1.2, page 6**--This section does not include the methodology used for radon decay product intakes. The units would be working levels (WL), not piococuries (pCi), and might also have to involve an equilibrium factor.

[redacted]

117. Section 7.2.1.3, p 7 The soil/sediment ingestion pathway is not limited to children. Incidental ingestion of soil by farmers, gardners, workers and other adult populations can be sizeable. An ingestion rate of 100 mg/day can be used for these population groups as shown on page 16 of this section. The text should be corrected here to show that all populations will be considered for this pathway.

118. Section 7.0, pp 8-11 The calculations for the ingestion of vegetables, fruit, dairy products and fish given on these pages should follow OSWER Directive 9285.6-03, Human Health Evaluation Manual Supplemental Guidance: "Standard Default Exposure Factors" or justifications presented for not following this guidance. Site-specific data should be used whenever possible. The fraction of home-produced fruits and vegetables may not be appropriate for the area surrounding the site, due to the high comsunption of home-grown and locally-grown products (some on FEMP and adjacent land). Parameter values given on page 15 should also be consistent with the OSWER Directive.

119. Section 7.2.1.4, page 8, equations 7-8 and 7-9 If RESRAD will be used for these calculations, are these the same equations used in the RESRAD code?

120. Section 7.2.1.5, Page 10, Paragraph 2 The text should explain how the two animal product concentrations (C_{iA}) will be combined when significant soil ingestion is a source of contamination.

121. Section 7.2.1.7, Page 12, Paragraph 2, Equation 7-22 Proposed values for the parameter listed should be indicated. The source of the values and the data used to support their selection should also be specified.

122. Section 7.2.2, Page 13, Paragraph 2, 3rd Bullet The following U.S. EPA documents should be listed:

- Superfund Exposure Assessment Manual, OSWER 9285.5-1, April 1988 (U.S. EPA, 1988).
- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors," Interim Final, OSWER 9285.6-03, March 25, 1991 (U.S. EPA, 1991).
- Air/Superfund National Technical Guidance Study Series, Volumes I (EPA-450/1-89-001, July 1989), II (EPA-450/1-89-002a, August 1990), III (EPA-450/1-89-003, January 1989), and IV (EPA-450/1-89-004, July 1989) (U.S. EPA, 1989c, 1989d).

123. Section 7.2.2, p 13 The reference list should include the OSWER Directive given above as part of the RAGS reference, as this Directive supercedes RAGS guidance in some cases. The Interim Guidance for Dermal Exposure Assessment, OHEA-E-367, March 1991, Exposure Assessment Group, OHEA, Washington, DC, and the recent update letter from John Schaum represent best available guidance regarding dermal absorption pathways and should be used and referenced here.

124. Section 7.2.2.1, Page 14, Paragraph 3 The text should specify which body parts were considered in estimating the skin surface area available for contact with soil or ground water. The rationale for their selection should also be provided.

125. Section 7.2.2, p 14 The adult 70 year exposure should include 6 years as a child for all ingestion pathways; the 200 mg/day ingestion rate is appropriate for this age group.

126. Section 7.2.2.1, p 14, Human Physiological Parameters The body weight usually used for the young child is 15 kg. The body surface area for this and other age groups may vary with the exposure scenario. Refer to the OHEA document (OHEA-E-367), section 2.4 , for default values. This guidance supercedes the reference used here.

127. Section 7.2.2.1, Page 15, Paragraph 1 The text should clarify whether an 18-year-old person is considered a child/teen or an adult. If such a person is considered a child/teen, then the exposure duration for that age group should be 13 years and not 12 years as shown. If an 18-year-old person is considered an adult, then the child/teen age group should be defined as ages 6 to 17 years.

128. Section 7.2.2.1, p 15, Exposure Duration See comments 117 and 125 above, regarding inclusion of populations for soil ingestion pathways.

129. **Section 7.2.2.1, page 15, Time Use Patterns** Although EPA Office of Radiation Programs assumes citizens are exposed indoor to radon for 75% of the year, Superfund guidance of 50% can be used here. This chart does not account for time spent below grade (radon decay product levels are greater in a basement) nor for time offsite.

130. **Section 7.2.2.1, page 15, Pathway** Values in this table do not agree with the default values in RESRAD. Assurance must be made that, consistently, across all codes used, there is agreement on specific and default parameters.

131. Section 7.2.2.1, Page 16, Paragraph 1 The soil ingestion rates presented are already averaged over a full 1-year period. The exposure frequency to be used with these rates should be 365 days per year.

132. Section 7.2.2.1, p17, FI The reference given here (1989a) has been superceded by more current guidance (1991c). This is the better reference for default values for vegetables, fruit, DW, and soil.

133. **Section 7.2.2.1, page 17, Item Ingested**--Are these assumptions the same as those in RESRAD? These values are not expressly stated in the code.

134. Section 7.2.2.2, p 20, PCs As noted in the prior review of this section, the permeability constants listed in the 1988 EPA document referenced here are not correct. Chemical-specific permeability constants should be obtained from the OHEA document referenced earlier or from ECAO. The PC of water is only appropriate as a default for inorganics; it may not be used for organic chemicals. See the Schaum letter included as an attachment.

135. **Section 7.2.2.1, page 20, Concentration Ratio** These biouptake factors are not the same as those used in RESRAD. Assurance must be made that, consistently, across all codes used, there is agreement on specific and default parameters.

136. **Section 7.2.2.1, page 21, Conversions for uranium**--The assumption that there is undisturbed uranium on site is extremely questionable. Why are these conversion values introduced?

137. Section 7.2.2.2, p 21, ABS Dermal absorption values should be taken from the OHEA document, Schaum leter updating this guidance and data provided by literature review from ECAO. The contractor should not use values from the open literature which have not been approved by ECAO.

138. **Section 7.2.2.1, page 22, Radiation Shielding Factor**--RESRAD assumes a factor of 0.7 in its occupancy calculations and a factor of 0.4 for indoor air concentrations compared to outdoor concentrations. Which will be used in these calculations?

139. **Section 7.2.2.1, General Statement**--This section lacks many of the parameters and equations associated with radon. What concentration to working level values will be used for radon-222, for radon-220? What equilibrium factors for the various isotopes of radon will be used, both indoors and outdoors?
What equations will be used to convert concentrations to working levels to working level months?

140. Section 7.2.3.5, p 10 As suggested in the past review of this section, it would seem more reasonable to use actual data for the radionuclide concentrations in meat and milk, rather than to model it. Some earlier data is available on the incorporation of radionuclides in these products and sampling could be included at the site to give more site-specific values. At the minimum, comparison with values obtained by actual measurements in other studies should be included in the risk assessment to support the values obtained by modeling.

141. **Section 7.2.3, page 22**--Radon decay product intake can be expressed as working levels (WL). Most radon dose conversion factors are expressed in working level months (WLM).

142. Section 7.3, p 22 As noted in the prior review, the method suggested for the calculation of the external radiation exposure requires some discussion. RAGS, pages 10-24, sugests that the pathways to be considered include immersion in contaminated air, immersion in contaminated water and radiation exposure from ground surfaces that are contaminated. Page 10-25 of RAGS recommends using methods identical to the calculation of internal exposures, so that contributions fron all pathways can be summed. Please address these points in this discussion.

143. Section 7.3, Page 23, Paragraph 0 A reference should be cited for the geometric values presented.

144. Section 7.4.2.1, Page 28, Paragraph 2 The criteria used in selection of the indicator species should be discussed.

145. Section 8.0, p2, lines 16-17 Toxicity values should be derived by ECAO using a full literature search. Where no guidance can be provided, it may be more desireable to do a qualitative risk assessment rather than use inappropriate toxicity values. Guidance from USEPA should be sought in such cases.

146. **Section 8.2, page 3, para. 4** Age specific and gender specific risk factors found in EPA 1989b, both Table 6-6 and 6-7, can be used in risk assessments. Risk factors for radon should also be defined in this document, both for radon-222 and radon-220.

147. **Section 8.5, page 7** The uncertainty discussion should be an honest appraisal of the limitations of the results developed but should avoid language that may discredit work that would have widespread acceptance in the scientific and regulatory communities.

148. Section 9.2.1.1, Page 2, Paragraph 3 Risk factors are available for exposure via inhalation and ingestion but not dermal contact. This paragraph should include a discussion of the method to be used to derive slope factors for estimating risks resulting from exposure via dermal contact.

149. Section 9.2.1.2, Page 3, Paragraph 1 The text should indicate how short-term (acute) risks will be quantified, and the source of acute toxicity values should be identified. Also, this paragraph should include discussion of the method to be used to derive reference doses for estimating risks resulting from exposure via dermal contact.

150. Section 9.2.1.2, Page 3, Paragraph 5 The text should note that although U.S. EPA (1989a) approves summation of noncarcinogenic risk by target organ, approval is required from the Environmental Criteria and Assessment Office (ECAO) for segregation of risks below the target organ level.

151. **Section 9.2.2.2, page 4, last para.** 10 cm is inappropriate for the radionuclides of concern at this site. Gamma emissions from radium-226, radium-228 and thorium-228, especially, may penetrate several ten's of centimeters of soil. For example, the dose from a 10 cm layer of thorium-228 under 50 cm of cover is still about 2-3% of the dose without cover.

152. Section 9.2.1.1, equation 9.2 Risk(T) is a mislabel. The cummulative risk shown in the equation should be properly labeled Risk (P) for pathway risk. The total risk is the risk from all chemicals in all pathways.
Risk(P) = Risk(chem1) + Risk(chem2) + ...Risk(chemi)
Risk(T) = Risk(P1) + Risk(P2) + ...Risk(Pi)

153. **Section 9.5, page 9, para. 1** The pledge should be to discuss estimations objectively, not to presume the entire estimate is overstated.

154. **Section 10.1.1, page 3** The issue of ARAR based cleanup goals versus risk based cleanup goals is laid out here. The document clearly takes the position of the former over the latter. This is an issue that needs resolution.

153. Section 10.1.2, Page 3, Lines 29 and 32 The text should explain more fully how chemical-specific Applicable,Relevant and Appropriate Requirement (ARARs) will be "subtracted" from the allowable dose limit and how the remaining dose limit will be apportioned to other radionuclides. An example would be helpful.

154. **Section 10.1.2, page 7, para. 2** The focus on uncertainties in this and many other sections seems to indicate that the final document will have this as a major theme. Hopefully, these discussions will be reasonable attempts to define limits for readers because a strongly biased message could greatly undermine the credibility of the document.

155. Section 10, Page 11, Paragraph 2 Worker exposure via incidental ingestion of soil should also be considered.

156. Attachment 1, Section 2.0--It would seem more appropriate to discuss the available data early in the report, as a separate section, and then discuss the constitutents of poetential concern subsequently.

157. Attachment 1, Section 5.1--The predominance of chemical terminology (hazard quotient, hazard index) over radiological terminology seems to indicate that this section will focus on chemical issues. Was this the intent?

[redacted]

REFERENCES

Lyman, W.J., 1982, Adsorption Coefficient for Soils and Sediments. In Handbook of Chemical Property Estimation Methods, Clyman and Others, Ed's.) McGraw-Hill, New York.

U.S. EPA, 1986, Guide lines (according to Page 6) on Air Quality Models (Revised). EPA-405/2-78-027R.

U.S. EPA, 1988, Superfund Exposure Assessment Manual. OSWER 9285.5-1 (April).

U.S. EPA, 1989a, Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part A), Interim Final, EPA/540/1-89/002 (December).

U.S. EPA, 1989b, Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities. Interim Final, EPA/530-SW-89-026 (February).

U.S. EPA, 1989c, Air/Superfund National Technical Guidance Study Series. Volume IV - Procedures for Dispersion Modeling and Air Monitoring for Superfund Air Pathways Analysis, Interim Final, EPA-450/1-89-004 (July).

U.S. EPA, 1989d, Air/Superfund National Technical Guidance Study Series. Volume III - Estimation of Air Emissions from Cleanup Activities at Superfund Sites, Interim Final, EPA-450/1-89-003 (January).

U.S. EPA 1989e, Air/Superfund National Guidance Study Series. Volume I - Procedures for Dispersion Modeling and Air Monitoring for Superfund Air Pathway Analysis, Interim Final, EPA-450/1-89-001 (July).

U.S. EPA 1990, Air/Superfund National Guidance Study Series. Volume II - Procedures for Dispersion Modeling and Air Monitoring for Superfund Air Pathway Analysis, Interim Final, EPA-450/1-89-002a (August).

U.S. EPA, 1991, Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual, Supplemental Guidance: "Standard Default Exposure Factors," Interim Final, OSWER 9285.6-03 (March 25).

[redacted]

ATTACHMENT

General Comments - One major conclusion of the meeting was that in order to evaluate and approve the workplan, the BTAG would need to have a better description of the site data, especially biological data, which will be used for the ecological assessment. The necessary information would include a description of the numbers, types, locations, methods and parameters analyzed for environmental, and especially biological samples.

In addition, for ecological risk assessments, which do not identify site impacts, estimates of exposure and toxicity must be conservative. Ecological investigations can assess toxicity and/or exposure directly through lab or field investigations (unlike human health assessments). However, results of the risk assessment may be useful to focus appropriate field investigations. Note that sometimes less conservative action levels result from field investigations.

Consequently, if the ecological assessment must use modeled values, the models must be conservative and validated through field investigations. Examples of data which should be field-validated include surface water concentrations, tissue concentrations (plant and animal), ambient toxicity, etc.

The following are comments by page and line number:

Page 3-2, lines 22-30 - As mentioned above, the BTAG cannot determine whether the data was collected in such a way (sample numbers, methods, etc.) that it is usable. The BTAG requested to review that information before drawing conclusions about whether the "data to be considered" should be considered.

Page 3-5, § 3.4 - Ecological data bases should be included in this list such as the EPA AQUIRE (AQUatic Information Retrieval).

Page 4-1, line 10 - Total organic carbon and total organic halogen can be very important for ecological assessment (for evaluating sediment toxicity, etc.), and such data should be retained.

Page 4-3, line 21 - The document must show how statistics used to evaluate a data set are appropriate statistics for that data set (e.g., in lines 32-36 of this page, data must be tested for normality before using student's t-testing). As the document currently exists, it proposes using the same statistical evaluations for most data sets. The methods proposed are generally used for human health risk assessment, but do not automatically apply to ecological assessment.

Page 4-5, lines 5-7 - The Remedial Project Manager and/or BTAG must decide whether contaminants can be excluded from further evaluation based on a review of available data, including the number of times a contaminant is detected in a particular area.

Page 4-6, lines 1-5 - A chemical of potential concern should not be eliminated based on its site-related mean since isolated areas of high contamination could be overlooked. The paragraph should be deleted.

Page 4-6, line 6 - Although potassium is a nutrient, K-65 should not be eliminated from chemicals of potential concern.

Page 4-6, lines 14-31 - The screening procedure discussed is not appropriate for ecological assessment. It is not appropriate for aquatic receptors and exposure because reference doses (RfDs) are not based on ambient toxicity. Also, since RfDs were developed for humans, they are not applicable to small mammals. The procedure may be acceptable if an uncertainty factor is added.

Page 5-9 - Figure 5-4 should be clarified (it does not clearly show which areas are wetlands).

Page 5-10, lines 9-12 - This section should state whether state endangered, threatened, or special concern species inhabit the site.

Page 5-10, lines 26-27 - Aging of radionuclides must be considered over the entire site rather than only in source areas.

Page 5-20, §5.2.1 - The BTAG asked 1) whether all of the possible exposure pathways will be used for data analysis and 2) to review data relevant to these pathways.

Page 6-24, line 9 - Sorption partition coefficients (K_d) are

normally site specific for inorganics, and strongly dependent upon total organic carbon for organic contaminants. Therefore, surface water concentrations obtained using the proposed model must be validated somehow, or the model output must be used conservatively.

Page 7-23, §7.4.1 - Because a large portion of contaminants consumed by herbivores/omnivores via vegetation consumption can come from wind-blown soil on plant surfaces, results of the Baes model require validation or must be used conservatively.

Page 7-28, §7.4.2.1 - A top carnivore, such as an owl or hawk, should be included in this list of receptors. Also, the vegetation intake calculation must use dry weight concentrations for soils and plants. This section should also clarify which of the animals listed are considered herbivores and which omnivores (American robin, red fox, raccoon). Finally, the nine samples mentioned may not be adequate to assess mammal bioaccumulation of contaminants. Again, a review of the data, including methods, is necessary to determine the data's adequacy.

Page 7-29, §7.4.2.1 con't - In lines 23-29, a default value of one is used for muscle-to-muscle and soil-to-muscle transfer coefficients. While a value of one may be somewhat conservative for contaminants which do not bioaccumulate to a great degree, it is likely low for bioconcentrating contaminants. Some bioaccumulation factors should be available from the following sources: scientific literature, the Office of Water (sludge transfer coefficients - some of which are usable while some are not), the Environmental Criteria and Assessment Office (biomagnification factors). Again, by conducting appropriate field investigations following this screening, site impacts can be more assessed directly.

Page 7-30, lines 1-2 - Since robins may undergo a high level of contaminant exposure via earthworm ingestion, and onsite robins may be suffering impacts (e.g., shorter wings as documented in the Facemire report), the earthworm exposure pathway should likely be measure directly.

Page 7-30, §7.4.2.2 - Radiation doses to terrestrial mammals must be assessed in the same way toxicity data was developed for a particular radionuclide. For example, if toxicity data was developed for dose to bone tissues only, appropriate data must be available for comparison.

Page 7-31, §7.4.3 - A terrestrial species consuming aquatic organisms must be added to the exposure assessment. For example, fish should be added to the raccoon diet.

Page 8-6, lines 32-34 - Calculated risks for separate toxic contaminants and radionuclides should be clearly distinguishable.

Page 8-7, lines 11-12 - The sentence beginning "Laboratory studies of toxicity...." should be deleted since the doses wildlife are exposed to are unknown at this point.

Page 8-7, lines 16-18 - Ambient toxicity testing can be used to assess the effects of multiple contaminants on aquatic organisms. Also, antagonistic effects are not likely to be applicable with the contaminants at this site, and the nature of this assessment mandates conservative assumptions. Therefore, delete the reference to "antagonistic."

Page 8-7, lines 19-24 - Ambient Water Quality Criteria (AWQC) should be used as one primary assessment reference for those contaminants with AWQC available.

Page 9-8, lines 3-6 - Additional field ecological investigations may be necessary to assess the accuracy of assumptions.

Page 10-3, lines 1-3 - Preliminary remediation goals should include not only to perform an environmental evaluation, but also to remediate environmental impacts.

Attachment 1 - Outline

1.3 - This section should include a summary of the findings of the Facemire report.

3.3 - This section must include a summary of existing data, including a summary of sampling strategies, etc., as previously described. BTAG would like to review this section before the first draft of the risk assessment is completed. Also, this report should include a description of how Ohio Environmental Protection Agency guidelines were followed in the benthic/fish community surveys conducted on Paddy's Run.

4.1 - An assessment of aquatic water and sediment toxicity should be included here. Also, the results should be summarized in reference to findings in the Facemire report and aquatic community studies.

4.2 - An assessment of reproductive toxicity should be included here.

5.0 - A section should be added which considers ecological pathways of exposure in future scenarios.

6.0 - The summary of the Facemire results could also be placed in this section, as well as the aquatic toxicity assessment.